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Personality as consequence and antecedent of bullying victimization in adolescence: A cross-lagged panel and genetically informed investigation[☆]

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ABSTRACT

Bullying victimization is a serious problem with far-reaching consequences for the victims. Research has concluded that certain personality factors are associated with the frequency of bullying victimization experiences, both cross-sectionally and longitudinally. Most longitudinal research to date has primarily focused on adulthood (e.g., workplace experiences), neglecting the reciprocal effects that bullying victimization and personality may have during adolescence, a phase particularly susceptible to personality change. Hence, this project investigated the reciprocal relationship between personality factors and bullying victimization using data from TwinLife, a study with a representative sample of about 4000 German twin families. Focusing on middle adolescence ($N \approx 1500$, $M = 13$ years), cross-lagged modeling revealed cross-sectional associations and correlated changes, but no reciprocal longitudinal relationship between certain personality dimensions and the frequency of bullying victimization. Bivariate Cholesky modeling was utilized to investigate the etiology of the cross-sectional associations. We identified common genetic causes underlying both bullying victimization and Agreeableness, Neuroticism, and Conscientiousness, which decreased with age. Thus, environmental factors, such as the social peer group and social connectedness, appeared to gain importance throughout adolescence, influencing both personality and the likelihood of experiencing victimization. Further research should incorporate and further examine environmental processes to improve our understanding of bullying victimization.

Bullying is a global phenomenon that occurs in all cultures, as shown in various studies (Man et al., 2022; Modecki et al., 2014). According to Olweus (1993), bullying can be described as a process of repeated psychological or physical violence carried out by an individual or a group with the intention of hurting others.

Research has identified personal features that may play a role in explaining who becomes a bullying victim (Cook et al., 2010; Mitsopoulou & Giovazolias, 2015). For example, rates of bullying

victimization were found to be positively related to Neuroticism (Kulig et al., 2019; Sutton & Keogh, 2000; Tani et al., 2003), whereas being more extraverted, conscientious, and agreeable were negatively correlated with bullying victimization (Mitsopoulou & Giovazolias, 2015). In addition, a behavior genetic study of victimization indicated that the probability of becoming a victim of bullying was partly heritable (Veldkamp et al., 2019), stressing that personal factors play a role in the victimization processes. Personality traits, as reflected by the Big Five

[☆] The TwinLife data are archived in the GESIS data catalog: https://search.gesis.org/research_data/ZA6701, doi:10.4232/1.13932. Data is only released for academic research and teaching after the data depositor's written authorization. This study was funded by the German Research Foundation (DFG) as part of the long-term project TwinLife (Grant number 220286500, <https://gepris.dfg.de/gepris/projekt/220286500>), awarded to Martin Diewald, Christian Kandler, Frank M. Spinath, and Rainer Riemann. The funder had no role in the study design, data collection and analysis, the decision to publish, or the preparation of the manuscript. The genetically sensitive analyses have been preregistered at osf (<https://doi.org/10.17605/OSF.IO/PX3CQ>). We have no conflict of interest to disclose. The TwinLife study was reviewed and approved by the German Psychological Society (Deutsche Gesellschaft für Psychologie; protocol number: RR 11.2009). All participants were informed in writing about the general aims of the TwinLife study, the incentives, and that their participation was voluntary and could be withdrawn at any time. In addition, participants received a two-page leaflet summarizing the procedures concerning data protection and privacy and their rights to request the deletion of all data collected in accordance with German data integrity laws. The written material was sent to participants prior to the interview. Further information on the data collection procedures can be found in Brix et al. (2017). Informed verbal consent was obtained from participants and the participants' legal guardians when the participants were underage and documented. Written informed consent from the participants or the participants' legal guardians or next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

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model, are also heritable to a moderate degree with average heritability estimates ranging from 31 % for Conscientiousness to 41 % for Openness in a meta-analysis (Vukasović & Bratko, 2015).

Differences in personality characteristics, however, can be seen not only as antecedents of bullying victimization but also as consequences. It is generally assumed that personality changes across the lifespan, with more pronounced changes in the younger years, and again much later in life, following a curvilinear trend (Specht et al., 2011). Research has shown that personality can change in reaction to major (negative) life experiences (Denissen et al., 2019), but results are mixed. In a longitudinal study, Extraversion and Neuroticism predicted positive and negative life events, with positive events being correlated with increases in Extraversion and negative events with increases in Neuroticism (Lüdtke et al., 2011). These findings suggest that life experiences are not random but partly result from personality traits that change in response to those life experiences. In another study, changes in personality were associated with stressful life events, which were most prominent in an increase of Neuroticism but also declines in Agreeableness and facets of Openness after the occurrence of stressful life events (Löckenhoff et al., 2009). However, effects are usually small and not necessarily long-lasting. Additionally, there is also evidence supporting a robustness of personality traits, even in the face of drastic life events (Cobb-Clark & Schurer, 2012). However, elaborate studies specifically investigating personality change in response to bullying victimization are scarce, especially for adolescence.

Some studies have investigated the reciprocal relationship of personality and bullying victimization; however, longitudinal studies have primarily focused on workplace bullying (e.g., Nielsen & Knardahl, 2015). One study found that bullying victimization at baseline was significantly associated with decreases in Agreeableness, Conscientiousness, and Openness at follow-up, while Neuroticism at baseline was a predictor of bullying victimization in a follow-up conducted two years later (Nielsen & Knardahl, 2015).

1. Aim of the present study

The reported findings suggest that personality traits may function both as predictors and as outcomes of bullying victimization (Nielsen & Knardahl, 2015). Yet, existing studies on the longitudinal interplay between bullying victimization and personality have mainly focused on adults and bullying at work (e.g., Nielsen & Knardahl, 2015). Adolescence, in particular, is a phase highly susceptible to personality change and development, making the study of the interplay at this age especially important (Ferguson, 2010). Furthermore, bullying victimization seems to be most prevalent during this period (Hymel & Swearer, 2015).

Furthermore, we investigated the extent of genetic and environmental factors underlying the phenotypic associations between personality and bullying. Genetic analyses offer the advantage of disentangling genetic and environmental influences on traits. Following Veldkamp et al. (2019), who proposed that the heritability of bullying victimization may partially be explained through personality variables (that are themselves moderately heritable), known to increase or decrease victimization risks, we hypothesize substantial genetic overlap between the Big Five personality traits and bullying victimization.

2. Methods

2.1. Sample

The data used in this study were obtained from the TwinLife project (Diewald et al., 2023). TwinLife is a 12-year survey of approximately 4000 German twin families. In terms of educational, occupational, and income structure, the sample is representative of the whole of Germany (Lang et al., 2019). For more information on the study, please consult Hahn et al. (2016).

For this study, data from the second face-to-face wave (collected in

Table 1

Sample characteristics, mean scores and standard deviations.

	T1 (N = 1597)		T2 (N = 1271)	
	M	SD	M	SD
Female (in %)	50.3		51.4	
Dizygotic (in %)	58.6		58.1	
Age	13.00	0.33	15.10	0.34
Bullying victimization frequency (1–4)	1.21	0.39	1.19	0.32
Neuroticism (1–7)	3.77	1.26	3.93	1.27
Extraversion (1–7)	4.86	1.24	4.71	1.33
Agreeableness (1–7)	5.36	1.02	5.38	0.97
Conscientiousness (1–7)	4.73	1.21	4.81	1.09
Openness (1–7)	4.89	1.13	4.86	1.05

Notes. *M* = mean, *SD* = standard deviation. Possible scale range in brackets.

2016/2017, hereafter referred to as T1) and third face-to-face wave (collected in 2018/2019, hereafter referred to as T2) were used. For the analyses, only twins from the second youngest cohort (born in 2003/2004) were included. Sample characteristics, mean scores, and standard deviations for the constructs of interest are presented in Table 1.

2.2. Measurement

More extensive information (e.g., exact item wording) about the scales used in this study can be found elsewhere (Klatzka et al., 2023).

2.2.1. Personality

Participants reported their personality at both measurement points using the Big Five Inventory - Short Version (BFI-S; Gerlitz & Schupp, 2014). Four items were used to assess Openness and three items were used for each of the remaining four factors. At T1, Cronbach's alpha varied from 0.50 (Agreeableness) to 0.67 (Conscientiousness), and at T2, it varied from 0.52 (Agreeableness) to 0.75 (Extraversion). Given the shortness of the scales, the scales showed reasonable reliabilities and the BFI-S has demonstrated good convergent and discriminant validity (Hahn et al., 2012).

2.2.2. Bullying victimization

In TwinLife, the German adaptation of the Gatehouse Bullying Scale (GBS; Bond et al., 2007) was used to assess bullying victimization. The frequency of bullying victimization was assessed using four items: teasing, rumors, social exclusion, and physical violence. The frequency was recorded on a 4-point scale from 1 ("Never") to 4 ("Most days"). The items were averaged to an overall victimization score. Cronbach's alpha was 0.66 and 0.56 for T1 and T2, respectively.

2.3. Statistical analyses

Cross-lagged panel models were computed for those personality dimensions that exhibited a significant zero-order correlation with bullying frequencies (see Table 2). All main analyses were conducted in R using the Lavaan package (Rosseel, 2012). Cluster-robust standard error estimation was applied to account for the nested structure of the data. Missing values were imputed using 200 imputed data sets with the miRun function from the semtools package (Jorgensen et al., 2022). Coefficients were pooled using Rubin (1987) rules.

We modeled the constructs as latent traits, fixed the loadings and intercepts across time points to be equal, and allowed the residuals of corresponding items to co-vary across time points. Additionally, every latent variable was controlled for sex and age, which were not part of the original study protocol but did not affect the reported results. This, however, ensured that the results were not confounded by sex or age effects.

Table 2
Zero order correlations.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Victimization T1	1.00													
2	Extraversion T1	-0.05	1.00												
3	Openness T1	0.04	0.26	1.00											
4	Agreeableness T1	-0.19	0.08	0.25	1.00										
5	Neuroticism T1	0.24	-0.23	0.06	-0.10	1.00									
6	Conscientiousness T1	-0.13	0.09	0.31	0.32	-0.18	1.00								
7	Victimization T2	0.36	0.01	0.07	-0.06	0.16	-0.07	1.00							
8	Extraversion T2	-0.02	0.60	0.15	0.02	-0.15	0.03	-0.02	1.00						
9	Openness T2	0.03	0.16	0.58	0.14	0.02	0.20	0.05	0.19	1.00					
10	Agreeableness T2	-0.19	0.03	0.20	0.51	-0.06	0.23	-0.15	0.00	0.24	1.00				
11	Neuroticism T2	0.11	-0.15	0.09	-0.01	0.48	0.02	0.18	-0.23	0.07	-0.02	1.00			
12	Conscientiousness T2	-0.06	0.00	0.18	0.23	-0.10	0.57	-0.07	0.07	0.27	0.27	-0.07	1.00		
13	Sex	-0.02	-0.06	0.15	0.15	0.21	0.13	0.06	-0.09	0.18	0.15	0.34	0.16	1.00	
14	Age T1	0.02	-0.01	0.02	-0.04	0.04	0.04	0.03	-0.03	-0.01	-0.01	0.06	0.04	-0.02	1.00

Note. Bold font indicates significance on a $p < .05$ level. Bold and cursive indicates significance on a $p < .01$ level.

2.3.1. Bivariate genetic analyses

In univariate twin models, similarities of identical and fraternal twins serve as the foundation for decomposing the phenotypic variance into additive genetic (*A*), shared environmental (*C*), or non-additive genetic dominance effects (*D*), and unique environmental (*E*) factors. Shared environmental influences represent factors that make twins more

alike (e.g., shared family environment), while unique environmental influences represent factors that contribute to the dissimilarity within twin pairs (e.g., specific life events for each twin sibling; Neale & Cardon, 2013).

Bivariate models follow a similar rationale by decomposing the covariance between two constructs, such as victimization and selected

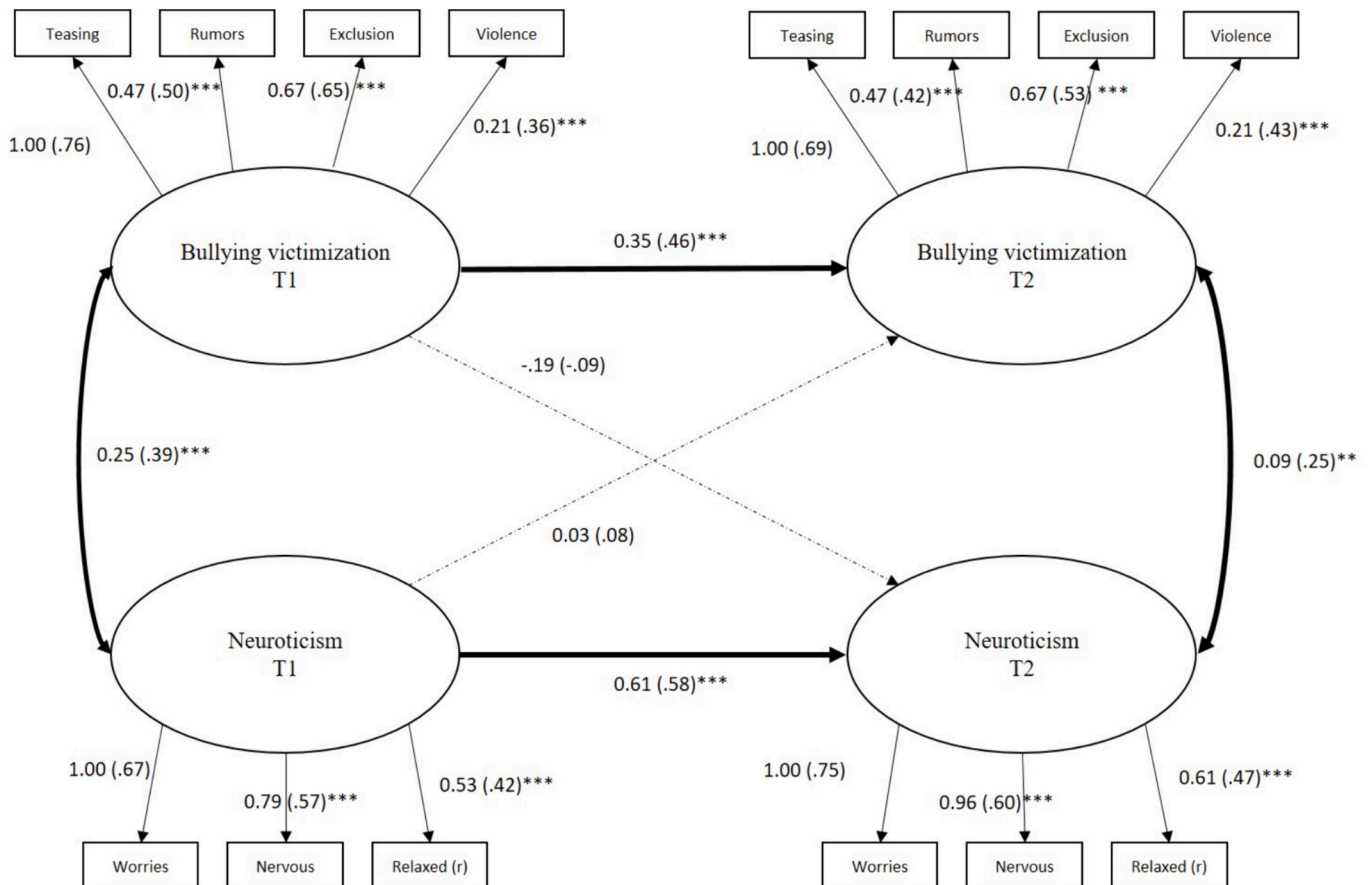


Fig. 1. Cross-lagged panel model for Neuroticism and bullying victimization (standardized coefficients in parentheses); * $p < .05$, ** $p < .01$, *** $p < .001$.

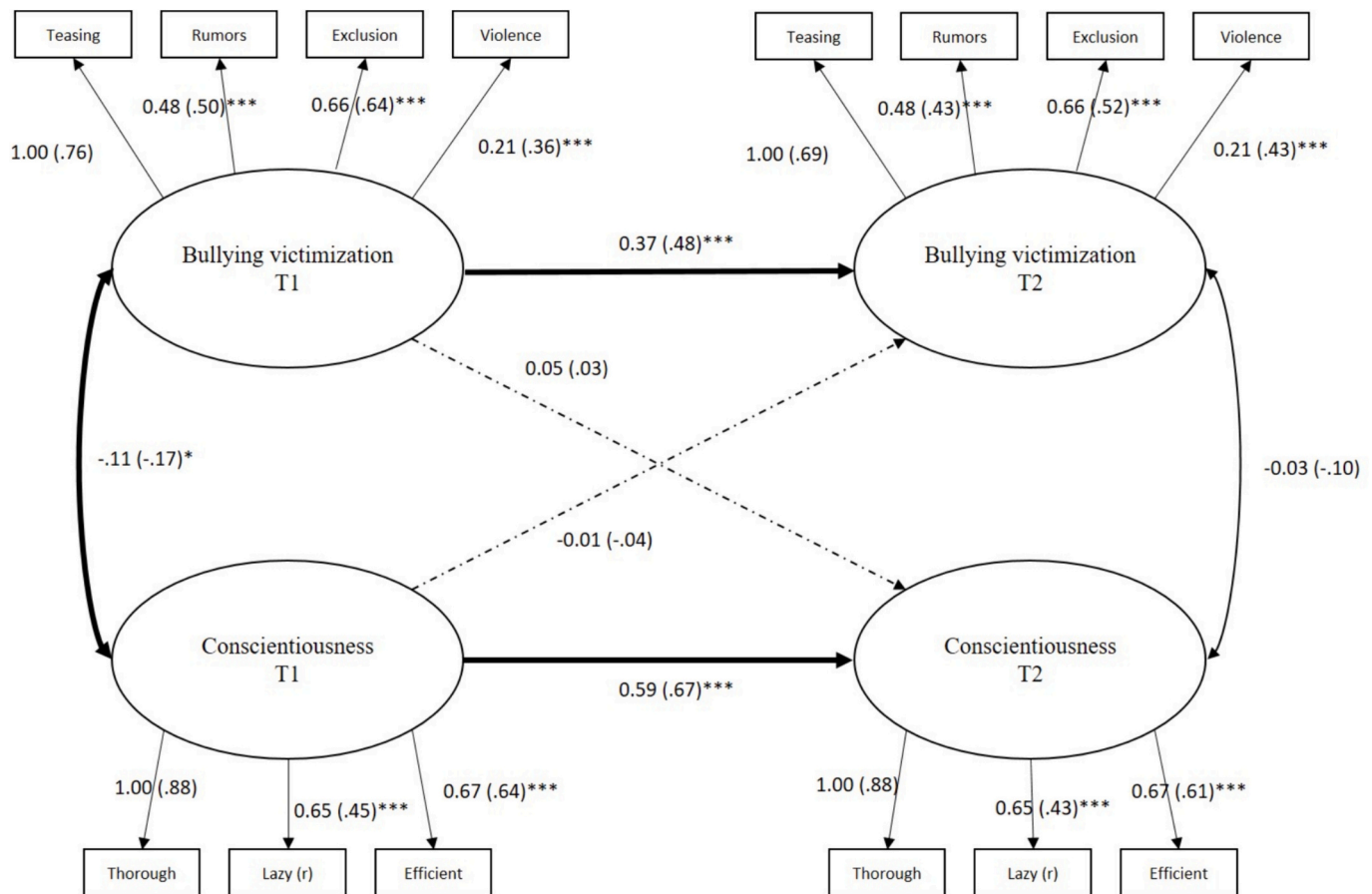


Fig. 2. Cross-lagged panel model for Conscientiousness and bullying victimization (standardized coefficients in parentheses); * $p < .05$, ** $p < .01$, *** $p < .001$.

personality traits, into A, C/D, and E pathways. The additive genetic correlation (r_a) represents the extent to which additive genetic factors that influence bullying victimization are correlated with genetic factors that influence personality. The model also estimates correlations between the C (or D) and E parameters (Loehlin, 1996).

All calculations were performed using the R package umx (Bates et al., 2019). The analyses were conducted for each pair of variables (victimization - Conscientiousness, victimization - Neuroticism, victimization - Agreeableness) at each time point, resulting in 3×2 models. Manifest mean scores were used for this set of analyses, with a maximum of one item allowed to be missing for the mean score to be computed. Scale missingness was handled using full-information maximum likelihood estimation. This set of analyses was pre-registered on OSF prior to conducting the analyses (see <https://doi.org/10.17605/OSF.IO/PX3CQ>). Deviating from the registered protocol for these analyses, we used the residuals of the mean scores after correcting for sex and age differences. However, this change did not affect the basic pattern of results. We tested different variations of the models and selected the best fitting model using the AIC.

3. Results

3.1. Zero-order correlations

At T1, a higher frequency of bullying victimization significantly correlated with higher scores in Neuroticism, as well as with lower scores in Agreeableness and Conscientiousness, a pattern that was also present at T2 (see Table 2). For these three constructs, we further investigated longitudinal associations.

3.2. Cross-lagged panel models

For the sake of readability, error terms and control variables (sex and age) are omitted from the graphs. Fig. 1 illustrates the cross-lagged panel model for bullying victimization and Neuroticism, showing a significant cross-sectional latent correlation at T1 ($r = 0.39$, $p < .001$). Additionally, the residuals at T2 were correlated ($r = 0.25$, $p < .001$). However, no cross-path was significant. Overall, model fit was acceptable ($n = 1567$, $\chi^2(96) = 246.79$, CFI = 0.93, TLI = 0.91, RMSEA = 0.03, SRMR = 0.04).

Fig. 2 depicts the cross-lagged panel model for bullying victimization and Conscientiousness. Conscientiousness and bullying showed a significant cross-sectional latent correlation only at T1 ($r = -0.17$, $p < .001$). No cross-path was significant. Model fit was acceptable overall ($n = 1567$, $\chi^2(96) = 208.57$, CFI = 0.95, TLI = 0.94, RMSEA = 0.03, SRMR = 0.04).

Fig. 3 shows the cross-lagged panel model for bullying victimization and Agreeableness. Consistent with the zero-order correlations, Agreeableness and bullying showed a significant cross-sectional latent correlation at T1 ($r = -0.24$, $p < .001$), as did the residuals at T2 ($r = -0.18$, $p = .001$). No cross-path was significant. Model fit was acceptable overall ($n = 1567$, $\chi^2(96) = 246.26$, CFI = 0.92, TLI = 0.90, RMSEA = 0.03, SRMR = 0.04).

3.3. Bivariate genetic analyses

Fig. 4 presents standardized estimates from the best-fitting bivariate model, including non-additive genetic (D) and unique environmental (E) effects. Univariate genetic influences on the personality factors (Neuroticism, Agreeableness, and Conscientiousness) and bullying were of similar magnitude, explaining just over one-third of the inter-individual variation in these variables. The remaining variance of the

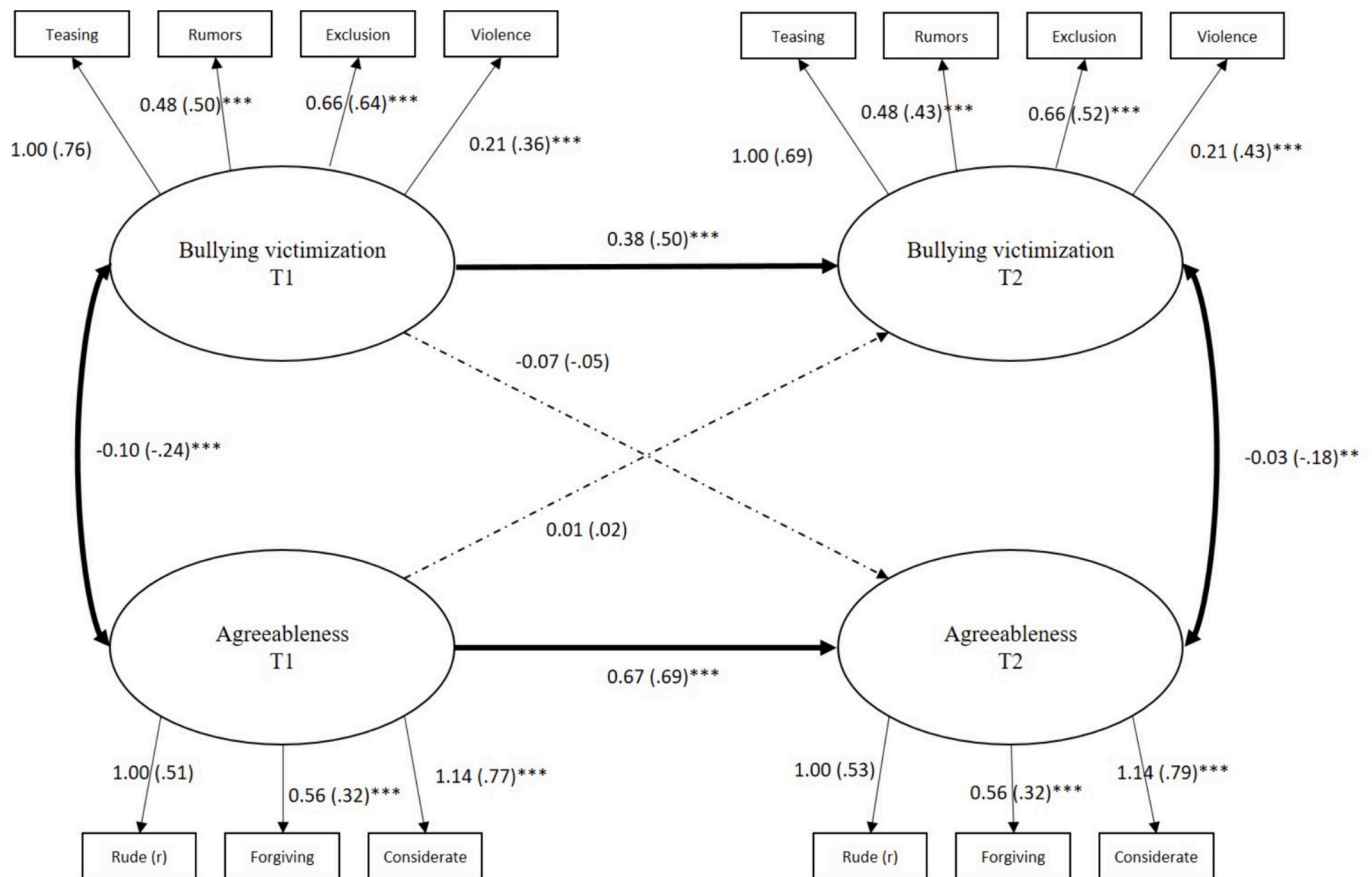


Fig. 3. Cross-lagged panel model for Agreeableness and bullying victimization (standardized coefficients in parentheses); * $p < .05$, ** $p < .01$, *** $p < .001$.

variables was due to unique environmental effects.

Fig. 5 presents the covariance between the personality factors and bullying along with the relative contribution of common genetic and environmental factors to this covariance. At the first time point, a common genetic factor explained more than half of the covariance between bullying victimization and personality factors, while the remaining covariance was explained by common environmental influences that are unique to each twin but apparently influenced both personality and bullying. At the second time point, both the overall covariance and the relative importance of underlying genetic factors diminished. Instead, common unique environmental influences now explained (more than) half of the covariance.

4. Discussion

Our analyses showed that personality characteristics were associated with the frequency of bullying victimization on both measurement occasions. Consistent with earlier findings, Neuroticism (see Alonso & Romero, 2017; Kulig et al., 2019; Machimbarrena et al., 2019; Mitsopoulou & Giovazolias, 2015; Tani et al., 2003), Agreeableness, and Conscientiousness (see Adamopoulou et al., 2020) showed associations with bullying victimization. While Agreeableness and Conscientiousness showed negative associations with victimization frequencies, Neuroticism was positively correlated. Extraversion did not correlate with bullying victimization in our study, despite some reports in the literature suggesting otherwise (Tani et al., 2003). The role of Openness to Experience is ambiguous in the literature (Glasø et al., 2007; Mulder & van Aken, 2014), and no significant association was found in this study. Effect sizes were small to medium, indicating that variables beyond personality are also involved in victimization processes. As demonstrated in the genetically informed analyses, the role of environmental

factors is pronounced in explaining victimization.

We tested for a reciprocal relationship between personality factors and the frequency of bullying victimization in a cross-lagged panel design. Contrary to the pattern observed in the cross-sectional analyses, our results indicated no reciprocal relationship between personality factors and bullying victimization across the two measurement points. These findings differ from previous research suggesting that chronic victimization is associated with increased negative emotions (Bollmer et al., 2006) or Neuroticism (Nielsen & Knardahl, 2015).

Although existing research suggests potential negative effects of bullying victimization on personality, our study did not find such effects. However, it is important to consider that the sample examined in this study differs in terms of age and contextual factors related to their bullying victimization. Our results indicate that bullying victimization may not yet have become a chronic, enduring phenomenon, as indicated by the relatively low stability of bullying victimization over time. The variability observed at this developmental stage may contribute to the lower heritability estimates for bullying victimization compared to earlier findings (e.g., Veldkamp et al., 2019). As the first study, to our knowledge, to explore the reciprocity between personality traits and bullying victimization during adolescence, our findings suggest that both the developmental stage of affected individuals and contextual factors may play pivotal roles in influencing the relationship between bullying victimization and personality.

To gain more insights into the (common) etiology of both bullying victimization and Neuroticism, Agreeableness, and Conscientiousness, we conducted genetically sensitive analyses. These analyses indicate that both genetic and environmental factors are important in explaining individual differences in victimization experiences and personality. For bullying victimization, the best-fitting model included only genetic and unique environmental effects, excluding shared environmental effects.

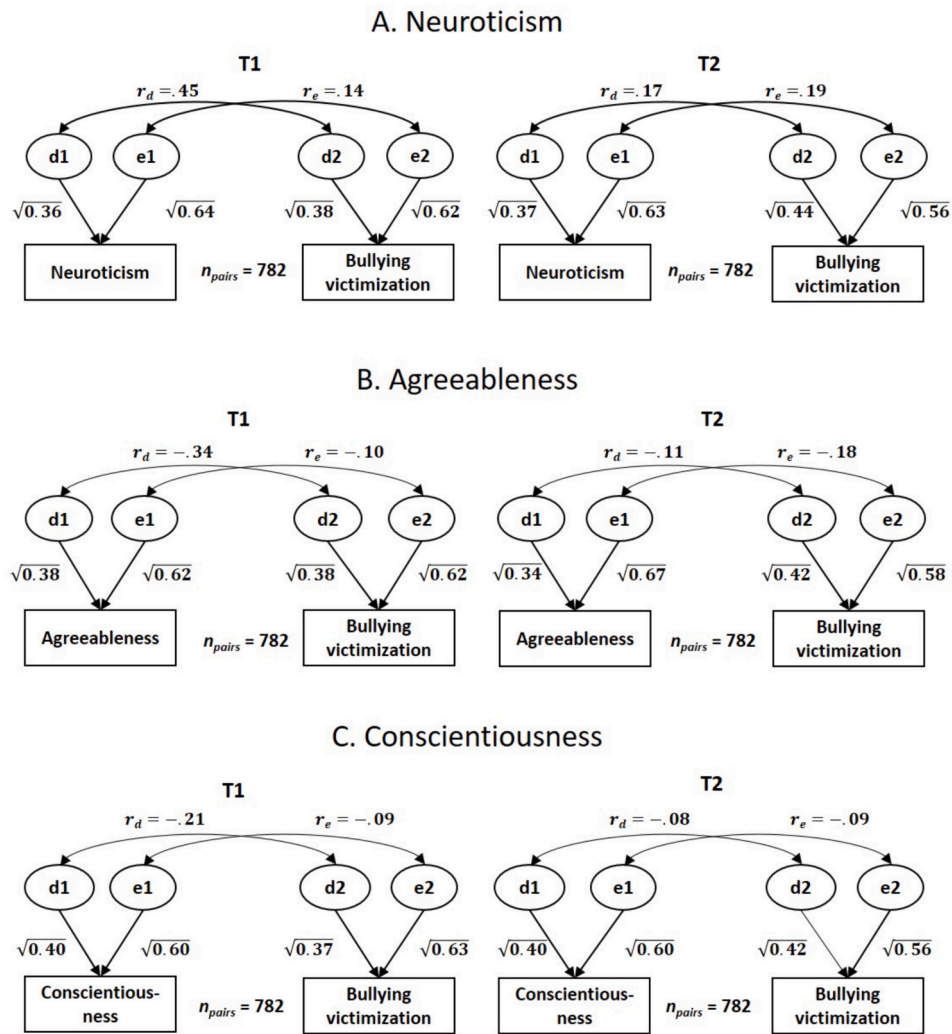


Fig. 4. Bivariate correlated factors models for A. Neuroticism, B. Agreeableness and C. Conscientiousness and bullying victimization for both time points. Depicted are the square roots of standardized and squared path coefficients and genetic or environmental correlations.

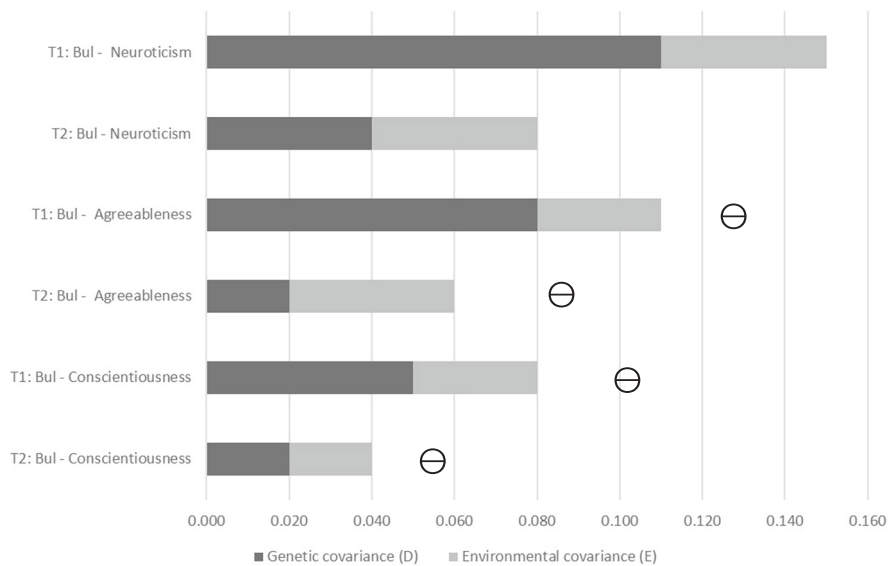


Fig. 5. Genetic and environmental proportions of the total covariance between bullying victimization (Bul) and personality factors. ⊖ The covariances involving Agreeableness and Conscientiousness were negative but were transformed to absolute values for display purposes. All manifest covariances were significant.

This finding aligns with previous research (Ball et al., 2008). However, some studies have identified a C-component in bullying victimization (Veldkamp et al., 2019). The magnitude of the genetic effects of the personality scales was somewhat lower than in previous studies, yet it remained comparable to the results of a meta-analysis on the heritability of personality scales (Vukasović & Bratko, 2015), despite the shortness of the scales used in this study. The etiology of the traits also showed considerable stability over the two-year period between measurements.

The genetic and environmental overlap of the etiology of the constructs varied across time-points. Although common genetic causes were the main source for the covariance of personality factors and bullying victimization, this pattern shifted after the two-year period, with common environmental sources explaining most of the covariance between the personality factors and bullying victimization. In other words, unique environmental influences that are shared between personality and bullying victimization appear to become more important as the participants aged. This aligns with a meta-analysis on predictors of bullying victimization that identified social problems, internalizing, and conduct problems as additional significant predictors in adolescence (Kljakovic & Hunt, 2016). As internalizing and conduct problems are linked to personality (Mezquita et al., 2015), one plausible explanation is the occurrence of evocative gene-environment correlations. In this dynamic, peers might respond to specific personality traits with bullying behavior, and individuals with certain personality traits might attract or repel particular peer groups. However, as individuals mature, it is possible that the influence of social peer groups and the wish for social connectedness gain prominence, affecting both personality development and the likelihood of experiencing victimization as a third variable.

4.1. Limitations

As is common in panel studies, short scales were used, which tend to result in lower reliability coefficients. However, the results of the univariate genetic analyses were comparable to the results of a meta-analysis on the heritability of personality scales (Vukasović & Bratko, 2015), suggesting that these short scales still provide validity. The items on bullying victimization were based primarily on social victimization processes in the school context, which poses a limitation as research has shown that different forms of bullying can have different consequences for the affected individuals (Man et al., 2022). A replication with a broader assessment of bullying victimization should be conducted in future studies.

The Big Five model has provided a valuable framework for personality research. However, recent studies indicated that the HEXACO model potentially covers more personality-related variance (Thielmann et al., 2022). Therefore, it would be beneficial to incorporate scales based on the HEXACO model in future studies.

The use of a twin sample may have impacted our results, as having a twin could potentially serve as a resource within the peer group that alters the likelihood of becoming a bullying victim. While our study acknowledges the potential impact of using a twin sample, it is essential to highlight the unique strengths inherent in this choice. Notably, twin populations offer a unique advantage in understanding bullying victimization, especially by enabling the investigation of both environmental and genetic effects. Although the sample was representative of Germany (Lang et al., 2019), replications in other countries and contexts are warranted.

In addition, the use of cross-lagged panel models has been criticized. A key criticism is that they may not account for stable individual differences that can bias estimates of causal relationships (Lucas, 2023). While these models may not fully capture stable individual differences, cross-lagged panel models still offer a valuable tool for understanding the dynamic relationships between variables over time, when interpreted with this limitation in mind.

5. Conclusion

Our findings show that Neuroticism, Agreeableness, and Conscientiousness are associated with the frequency of bullying victimization, while Extraversion and Openness are not. Contrary to findings from studies involving older participants and workplace settings, our study found no evidence of a reciprocal relationship between personality factors and bullying victimization across two years in an adolescent sample.

The inconsistency of victimization events over time likely explains the limited and impermanent personality changes observed in our study. This suggests that personality, while influenced by experiences, possesses an inherent stability, resisting dramatic shifts from temporary stressors. Our study highlights the importance of considering both developmental stage and context when investigating the influence of bullying victimization on personality and vice versa. The genetically informed analyses demonstrated the role of both genetic and unique environmental factors in explaining individual differences in personality traits, bullying victimization and their associations. Further research, potentially incorporating longer time spans, is needed to replicate and expand upon these findings. Moreover, it is worth noting that the Big Five personality traits, being broad constructs, may provide a valuable foundation for understanding the psychological factors related to bullying victimization. However, exploring narrower traits such as self-esteem could offer a more focused approach to uncovering the intricate relationships underlying bullying victimization.

CRedit authorship contribution statement

Christoph H. Klatzka: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Oliver Raufeisen:** Writing – original draft, Formal analysis, Conceptualization. **Elisabeth Hahn:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization. **Frank M. Spinath:** Writing – review & editing, Writing – original draft, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

There are no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2024.112842>

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